CHAPTER 3

3. AFFECTED ENVIRONMENT AND EXISTING CONDITIONS

3.1 Introduction

TVA's Energy Vision 2002 EIS (TVA, 1995) provides detailed information about the physical and social environment of the TVA region. The subsequent discussion tiers from and updates the information provided in this EIS.

3.2 Socioeconomic Environment of the Tennessee Valley Region

The TVA power service region is described in the Background section of this EA. In the year 2002, this region had a civilian nonfarm employment level of about 3.9 million, with total personal income of $222 billion (2002 dollars),[1] and gross regional product of $260 billion. Per capita personal income in the region was $25,894 the same year, or about 83 percent of the national average.

Over half (about 57 percent) of the region's population live in metropolitan counties, compared to about 80 percent nationally. In 2002, about 20 percent of total nonfarm employment in the region was in manufacturing, as compared to slightly less than 13 percent for the nation (Estimates by TVA, based on data from U.S. Department of Labor Statistics, and U. S. Department of Commerce, Bureau of Economic Analysis). Manufacturing's predominance in the region is due in part to favorable market access and transportation, especially in regard to the Northeast, Midwest, Southwest, and Florida, to a work force with strong work habits, and to relatively low resource costs, including wages, water, electricity, and land.

The Economy - Manufacturing remains a vital driving force in the regional economy, although its share of civilian nonfarm employment in the region declined from 27 percent in 1989 to 20 percent in 2002. At the same time, manufacturing's share of gross regional product dropped only slightly from about 26 percent in 1989 to a little less than 23 percent in 2002, reflecting a relative decline in manufacturing sectors such as textiles and apparel and increases in sectors such as transportation equipment, nonelectrical machinery, and metals that have higher value of output per worker.

Although manufacturing remains a core component of the region's economic base, nonmanufacturing industries accounted for over three-fourths of total gross regional product in 2002. The service sector, which makes up the largest share of the nonmanufacturing side of the economy, has been providing and is expected to continue to provide the great majority of new jobs in the region.

From 2000 to 2015, the region is expected to outperform the nation overall, with gross regional product increasing 3.2 percent per year on average, compared to 3.0 percent nationally. Manufacturing product is expected to increase more slowly than in the nation, but product in the service sector is expected to increase slightly faster in the region, 3.3 percent per year compared to 3.2 percent nationally. Employment is expected to increase more rapidly in the region, with nonfarm payroll employment

[1] All dollar values for the regional and national economies are expressed in constant 2002 dollars in order to remove the effects of inflation and facilitate comparison over time.

increasing at the rate 1.1 percent per year, compared to 1.0 percent nationally. Services employment is also expected to increase faster in the region, 2.2 percent compared to 2.1 percent nationally. Manufacturing employment is expected to continue to decline both regionally and nationally, losing an average of 0.9 percent annually in the region and 0.6 percent annually in the nation.

Population - In 2000, almost 8.4 million people lived in the TVA power service area, with about 57 percent residing in metropolitan areas (United States Department of Commerce, Bureau of the Census, 2000). These metropolitan areas range in size from over 1.2 million (Nashville) to 107,000 (Jackson, Tennessee). These areas are distributed fairly evenly throughout the region, without any one large dominating area. Surrounding these metropolitan areas are numerous satellite cities, which, along with the surrounding rural communities, are connected by both economic and transportation links. Thus, the region, while largely rural, is generally well served by centers of commerce and government, and the workforce is evenly distributed across the region rather than focused in any particular central area.

The population of the TVA power service area increased at a rate of 1.4 percent per year between 1989 and 2000, somewhat faster than the national rate of 1.2 percent per year. The region is expected to continue growing faster than the nation, at a rate of 1.1 percent per year between 2000 and 2015, compared with an expected growth rate nationally of 1.0 percent per year.

Environmental Justice - Within the region as a whole, minority populations (persons who are nonwhite or who are Hispanic or Latino) constitute 20.6 percent of the total, about 1.72 million persons. This percentage is well below the nation's 30.9 percent. However, the distribution of the nonwhite population is uneven across the region. There are greater concentrations in the central counties of metropolitan areas and in an area including most of the region's Mississippi counties, Memphis, and the area north and east of Memphis. Many of these areas have much higher minority population shares than does the nation as a whole.

According to the 2000 Census of Population, the poverty rate in the region is 14.1 percent, slightly higher than the national rate of 12.4 percent. Concentrations of poverty are found in all portions of the region, although much of this poverty is found in inner city areas and in rural counties. At the county level, most of the higher poverty rates are found in rural counties in Mississippi and in the eastern part of Tennessee.

3.3 Energy Use

As stated in the Socioeconomic Impacts section, TVA supplies electricity to a population of approximately 8.3 million people and a mix of residential, commercial, and industrial customers in the power service area. TVA had energy sales totaling 157,794 gigawatt-hours (GWh) for the fiscal year (FY) ending September 30, 2002. The sales included 128,600 GWh to retail distributors serving residential, commercial, and industrial customers; 27,500 GWh to industrial customers directly served by TVA; and 1,674 GWh to federal agencies and others. TVA anticipates continued growth in demand for energy. The latest energy forecast (Table 3-1), using historical data up through 2002 and completed in January 2003, anticipates TVA sales to reach 186,565 GWh in 2010 and 194,223 GWh in 2015. TVA's current forecast and the analysis of rate restructuring assume TVA will continue to be the provider of full requirements for its current 158 distributors and 62 directly served industrial and federal customers (i.e., that TVA rather

than other energy suppliers will provide all of the electricity needed by its current customers). The changes in sales listed in this EA are all based on the sales differences between the January 2003 forecast and the alternative rate structures being considered.

Table 3-1. TVA Sales (GWh) of Energy to Distributors, Directly Served Customers, and Federal and Interdivisional Entities

Class	FY 2002	FY 2010	FY 2015
Distributors	128,600	155,190	172,871
Directly Served Industrial	27,500	29,700	19,677
Federal and Interdivisional	1,694	1,675	1,675
Total Sales	157,794	186,565	194,223

3.4 Air Resources

Air quality is an environmental resource value that is considered important to most people. Through its passage of the Clean Air Act (CAA), Congress has mandated the protection and enhancement of our nation's air quality resources. National ambient air quality standards for the following criteria pollutants have been set to protect the public health and welfare:

- sulfur dioxide (SO_2)
- ozone (O_3)
- nitrogen dioxide (NO_2)
- particulate matter whose particles are less than or equal to 10 micrometers (PM_{10})
- particulate matter whose particles are less than or equal to 2.5 micrometers ($PM_{2.5}$)
- carbon monoxide (CO)
- lead (Pb)

Except for the portion of White Top Mountain above 4,500 feet elevation in Smyth County, Virginia, there are no areas within the TVA region that failed to meet the currently applicable standards in 2002 (areas not meeting the standards are called "nonattainment" areas). However, the attainment status for the new $PM_{2.5}$ and eight-hour O_3 standards is in the process of being established. Available data suggest that a number of locations throughout the TVA region (and elsewhere in the country) will have difficulty achieving the new standards and will be nonattainment areas for a period of time.

The implementation timeline for the new $PM_{2.5}$ standard requires monitors to be in place nationwide between 1998 and 2000 with data collection taking place between 1998 and 2003. The attainment status of areas will be determined after three years of data have been collected or in 2004 to 2005. The United States Environmental Protection Agency (EPA) has recently proposed an implementation strategy and timetable for the new eight-hour O_3 standard. Currently, the only nonattainment areas for the one-hour O_3 standard in or near the TVA region, which are being replaced by the eight-hour standard, are the Birmingham, Alabama, area, the Atlanta, Georgia, area, and a small area in southwestern Virginia. Attainment status designations for the eight-hour standard are

scheduled to be announced in April 2004. The state of Tennessee and certain counties at high risk for being in nonattainment have agreed to participate in EPA's Early Action Compact to develop strategies for bringing potential O_3 nonattainment areas into attainment earlier than otherwise required.

Prevention of Significant Deterioration (PSD) regulations have been established to ensure that areas with good air quality do not lose this desirable status. PSD rules restrict the increment by which ambient pollutant levels may increase due to emissions from major new sources or the modification of existing sources. Before new sources can be constructed or existing sources modified in a major way, permits to construct must be obtained from the states or EPA. Sources must demonstrate that PSD increments and applicable ambient air quality standards will not be exceeded and that they will install and use state-of-the-art pollution-control equipment (Best Available Control Technology – BACT).

More stringent PSD increments apply for sources affecting specially protected areas (PSD Class I) such as national parks and wilderness areas. Dispersion analyses (mathematical computer analyses) are generally required for sources subject to PSD review that are within approximately 62 miles of such an area. Class I areas in or near the TVA region include Mingo National Wilderness Area in southeastern Missouri, Mammoth Cave National Park in south-central Kentucky, Sipsey National Wilderness Area in northwestern Alabama, Cohutta National Wilderness Area along the border of northern Georgia and southeastern Tennessee, Joyce Kilmer/Slickrock National Wilderness Area along the North Carolina-Tennessee border, Great Smoky Mountains National Park along the North Carolina-Tennessee border, Shining Rock National Wilderness Area in western North Carolina, and Linville Gorge National Wilderness Area in western North Carolina.

Trends in air pollution in the TVA region have been toward generally improved conditions over the past two decades. The greatest gains have been for SO_2, particulate matter, and CO. Nitrogen oxides (NO_x), O_3, and Pb had the least gains (although levels of Pb emissions have significantly declined since the promulgation of the CAA in 1970). CO and Pb are not regional problems, but the other four are related to concerns about levels of O_3, fine particulate matter, acidic deposition, visibility, and regional haze. The most sensitive areas in the region are high elevation, forested areas such as the Great Smoky Mountains National Park.

Although ambient levels of particulate matter in this region have decreased and there are currently no particulate nonattainment areas, future implementation of the new fine particle standard is expected to result in additional emission reductions of precursor pollutants (pollutants that transform into fine particles). SO_2, NO_x, and carbon are such precursor pollutants. Strategies to reduce fine particle levels are expected to include additional controls on sources of SO_2 (power plants and industrial boilers), NO_x (motor vehicles, power plants) and carbon (diesel engines, including diesel-powered motor vehicles). Carbon is the dominant form for fine particles in urban areas, and the dominant form in rural areas is sulfur-containing particles. TVA has been reducing its SO_2 emissions since the mid-1970s and is implementing additional reductions that will help to decrease sulfur-containing particles in the region. Based on the planned schedule for these reductions on the TVA system, emissions will be reduced by an additional 272,000 tons/year by 2010. In addition, this effort is expected to contribute to

reductions in acid deposition and regional haze. TVA is also reducing its NO_x emissions and expects to achieve a 75 percent reduction across its system by 2005.

O_3 is a pollutant of concern during the "ozone season" of May through September and is usually at the highest concentrations in the summer months. NO_x and volatile organic carbons, which produce O_3 in the lower atmosphere, are the primary air pollutants that are involved in the complex reactions driven by warmth and solar radiation. In this region, natural sources of volatile organic carbons (e.g., trees) far exceed human sources, so reduction of NO_x is the most effective way to lower ambient O_3 concentrations. Reductions of emissions from electric generating facilities during the past two decades have apparently been largely offset by increases in emissions from other sources such as mobile sources, which continue to increase in numbers. TVA is implementing a major summertime reduction program involving selective catalytic reduction systems being installed at coal-burning generating plants to reduce its emissions of NO_x further during the May-September ozone season (see discussion above). These reductions are expected to total 57,000 tons/year by 2010.

Acidic deposition, also commonly referred to as acid rain, which is in excess of natural acidity, is primarily associated with human-caused emissions of SO_2 and NO_x. In 1990, Congress amended the CAA to require electric utilities to reduce SO_2 and NOx emissions in order to remedy acid deposition. As a result, TVA and other utilities with fossil-fuel generation have been significantly reducing their SO_2 and NOx emissions (see preceding discussion). Notable decreases in acid deposition have resulted. The additional SO_2 and NO_x reductions now underway on the TVA system and elsewhere are expected to reduce the acidic deposition further.

Regional haze is another issue of concern in the TVA region. Human-caused pollutants, including SO_2 and NO_x, have increased the haze from the natural levels found in the region. Much of the reduction in visibility associated with the haze in this region is due to fine sulfate particles. Strategies to reduce haze are focused on restoring visibility in PSD Class I areas such as the Great Smoky Mountains National Park. The TVA programs for further reduction of SO_2 and NO_x emissions from TVA electric generating plants are expected to help in improving visibility in this region.

Among toxic or hazardous air pollutants, mercury has been given greater emphasis in recent years. Proposals for regulatory controls on emissions of mercury from fossil-fuel electric generating plants are expected to lead to mandatory emissions limits by 2007 or later.

3.5 Water Resources

The quality of the region's water (surface water and groundwater) is critical to protection of human health and aquatic life. These water resources provide habitat for aquatic life, recreational opportunities, domestic and industrial water supplies, and other benefits. Water quality can be affected by point source wastewater discharges from cities and industries and by runoff from numerous nonpoint source activities such as construction, agriculture, mining, and air deposition.

The scope of this EA covers the TVA power service area (Figure 1-1), which includes the entire Tennessee and Cumberland River basins and portions of the lower Ohio, lower Mississippi, and Green River basins. TVA operates 11 fossil-fueled and three nuclear-powered generating facilities on mainstream and tributary reservoirs, as well as

riverine portions of these water bodies. Fresh water abounds in this area and generally supports most beneficial uses, including fish and aquatic life, public and industrial water supply, recreation, irrigation, and navigation. Water quality in the TVA region is generally good.

Sources of Pollution - Pollution involves a change in water quality that adversely affects a beneficial use, such as swimming or aquatic life. Nonpoint sources of pollution are the largest contributor to adverse impacts in the region. These include land disturbing activities like construction, agriculture, and mining that result in the runoff of sediment, nutrients, and other potential pollutants. There is also a variety of industries (see Socioeconomic Impacts section) and municipalities in the region that have point-source discharges of treated wastewater effluent that are regulated under the state pollution control programs discussed below. These programs are implemented to ensure that use criteria are identified, adequate monitoring of water quality takes place, and that water bodies meet their intended uses and quality. Based upon total employment, the largest sectors in the region include services, wholesale and retail trade, nonfarm proprietors, manufacturing, and government. By far, the largest nonconsumptive user of water in the region is TVA through its withdrawal and discharge of cooling water for 11 fossil and three nuclear power plants. This once-through, noncontact use for cooling returns the water to the river system essentially unchanged in quantity and quality, however.

State Pollution Control Programs - State regulations established under the Clean Water Act to protect water quality have three key components: (1) designated uses, (2) water quality criteria, and (3) allowable waste loads. Designated uses identify the important beneficial uses of each stream segment that need to be protected (e.g., recreation, fish and aquatic life, water supply, and navigation). Water quality criteria specify the conditions that must be maintained in the stream to protect each designated use (e.g., the minimum dissolved oxygen (DO) concentration necessary for a healthy fish population). The allowable waste load is the amount of waste that can be discharged and assimilated without violating the water quality criteria and adversely impacting the designated use. The wastewater discharge of an industry or municipality is limited by a National Pollutant Discharge Elimination System (NPDES) permit that specifies the allowable quantity and quality of effluent.

States are required periodically to submit a 305(b) report and 303(d) list to EPA. These documents identify the “impaired” lakes and streams that are not complying with water quality criteria and, consequently, are not suitable for their designated use. The 305(b) reports provide a comprehensive and recent summary of water quality in each state.

Since the state of Tennessee comprises over half of the TVA power service area, the quality of Tennessee rivers and lakes provides a general indication of conditions in the region. Approximately 29,000 miles of the 60,000 miles (49 percent) of streams in Tennessee and 531,000 acres of the 537,000 acres (99 percent) of lakes have been assessed and reported in the most recent 305(b) report (Tennessee Department of Environment and Conservation [TDEC], 2002). Table 3-2 indicates that about 70 percent of the streams and 79 percent of the lakes in Tennessee are fully supporting their designated uses. For those waters not fully supporting their designated uses, Table 3-3 summarizes the pollutants that are causing the impairment and their sources. State 305(b) reports for the other six states making up the remainder of the TVA power service area indicate similar information.

Table 3-2. Percent Use Support in Assessed Streams and Lakes in Tennessee

Stream Assessment	Percent of 29,406 Assessed Stream Miles	Percent of 530,629 Assessed Lake Acres
Fully Supporting Use	69.8	78.5
Partially Supporting Use	24.4	5.1
Not Supporting Use	5.8	16.4

Table 3-3. Impairing Pollutant and Sources in Tennessee Streams and Lakes

Streams		Lakes	
Pollutants and Sources	**Percent of Assessed**	**Pollutants and Sources**	**Percent of Assessed**
Pollutant		PCBs	48.0
Siltation	27.9	Chlordane	5.6
Habitat Alteration	25.1	Dioxins	5.3
Pathogens	19.6	Siltation	9.2
Nutrients	9.1	Nutrients	8.0
Organic Enrichment/ low DO	6.9	Low DO	7.9
Metals	2.5	Flow Alteration	5.8
pH	2.2	Metals	1.6
Flow Alteration	1.5	Pathogens	0.5
Organics	2.2	pH	5.6
Others	3.1	Others	2.5
Total	100.0		100.0
Source			
Agriculture	37.2	Contaminated Sediment	61.0
Hydrologic Modification	20.8	Agriculture	10.1
Construction	8.4	Eutrophication	9.7
Urban Runoff	8.7	Construction	6.9
Collection System Failure	3.2	Habitat Modification	6.9
Mining Activities	3.9	Hydrologic Modification	2.1
Municipal	3.3	Others	3.3
Industrial	1.3		
Other States	2.7		
Others	10.6		
Total	100.0		100.0

TVA Monitoring Activities - In addition to the state programs, TVA conducts extensive aquatic monitoring to ensure that thermal and other discharges from TVA-generating facilities do not cause adverse impacts even at permitted levels. This includes examining potential effects on spawning and development of cool-water fish species, such as sauger, the attraction of fish to thermal plumes from power plants, and possible increases in undesirable aquatic life, such as zebra mussels and blue-green algae. TVA also conducts "Vital Signs Monitoring" of rivers and reservoirs in the Tennessee Valley (TVA, 2002). The major components include monitoring: (1) the ecological health or biological integrity of TVA reservoirs; (2) conditions in tributary streams and watersheds; (3) toxic contaminants in fish flesh; (4) the number and size of important game fish; and (5) bacteriological concentrations at recreational areas. Results of these monitoring activities are provided to the states and included in their 305(b) assessment reports.

Aquatic Life - The construction of dams and reservoirs has fundamentally changed the character and aquatic faunas of the major rivers in the power service area. While dams promote navigation, flood control, power benefits, and river-based recreation by moderating the flow effects of floods and droughts throughout the year, they also change the daily, seasonal, and annual flow patterns that influence aquatic habitat and aquatic life.

Reservoirs on tributary rivers are typically deep and retain water for long periods. Low flow rates and regular periods of thermal stratification can result in low DO concentrations in the deeper waters. These aquatic habitats are simplified relative to natural streams, and fewer species are found. Lack of minimum flows and low DO in the first few miles below tributary dams may severely limit the habitat needed by native fish. This may restrict their movement, migration, reproduction, and available food supply.

Dams on tributary rivers affect the habitat of benthic invertebrates (benthos), which are a vital part of the food chain of aquatic ecosystems. Benthic life includes worms, snails and crayfish, which spend all of their lives in or on the streambeds, and aquatic insects, mussels and clams, which live there during all or part of their life cycle. Many benthic organisms have narrow habitat requirements that are not always met in reservoirs or tailwaters below dams. Further downstream from dams, the number of benthic species increases as natural reaeration occurs and DO and temperature rise.

Mainstream reservoirs differ from tributary reservoirs primarily in that they are shallower, have greater flows, and thus retain the water for a shorter period of time. They generally do not become as strongly stratified as tributary reservoirs. Although DO in the lower lake levels is often reduced, it is seldom depleted. Winter drawdown on mainstream reservoirs is much less severe than on tributaries, so bottom habitats generally remain wetter all year. This benefits benthic organisms, but promotes the growth of aquatic plants in the extensive shallow over bank areas of some reservoirs. Mainstream reservoirs in the power service area generally support healthy fish communities, ranging from about 50 to 90 species per reservoir. Good to excellent sport fisheries exist, primarily for black bass, crappie, sauger, white and striped bass, sunfish, and catfish. The primary commercial species are channel and blue catfish and buffalo fish.

*Groundwate*r - Groundwater refers to water located beneath the surface in rock formations known as aquifers. Approximately half of the region has limited groundwater availability because of natural geohydrological conditions.

More than 60 percent of the region's residents rely totally, or in part, on groundwater for drinking water. More than 1.7 million residents (22 percent) in the region maintain individual household groundwater systems, usually a well. All areas in the Tennessee Valley region can generally supply enough water for at least domestic needs. For the most part, the groundwater quality is adequate to support existing water supply uses even though some minimal treatment, such as filtration and chlorination, is sometimes required.

3.6 Land Use

The TVA power service region is considerably more rural than the nation as a whole. In the region, about 44 percent of the population resides in rural areas, while only 21 percent resides in rural areas nationwide. However, population density in the region is higher than the national average. In the region, the average density in 2000 was 107.9 persons per square mile, compared to the national average of 79.6 persons per square mile. However, the distribution within the region, as within the nation, is very uneven. For example, in 2000, Davidson County, Tennessee (Nashville), had a density of 1,134.6 persons per square mile while Clay County, about 70 miles to the northeast, had a density of 33.8 persons per square mile. The region consists of about 50 million acres of land, of which almost 21 million, a little less than 42 percent, is in farms. The percent of land in farms is similar to that of the nation, which has slightly more than 41 percent of its land in farms. Much of the industrial activity in the region is located in suburban and rural areas. Residential development is widely distributed in suburban and rural areas, where most of the growth has been in recent years, as well as in the region's towns and cities. Commercial development also has been spreading into suburban and rural areas in recent years.

3.7 Solid and Hazardous Waste Generation

Residential, Commercial, and Industrial Wastes - Residential and commercial wastes are usually generated in many, diffusely situated localities and handled at municipal solid waste landfills. Most municipalities and counties currently engage in long-range planning processes to ensure that adequate capacity is provided for solid wastes generated within their jurisdictions. Solid waste reduction and recycling is an important emphasis in most of these plans. For example, in the state of Tennessee, the 1991 Solid Waste Management Act (as amended) sets forth a 25 percent reduction and diversion goal (on a per capita basis) by June 30, 2003. It established 1989 as the base year for comparison. In 1989, Tennessee businesses, industries, citizens and others disposed of 6 million tons of solid waste, which equated to 1.23 tons per capita. In 2001, the State's waste generation rate was 0.92 tons per capita.

Recycling collection and processing facilities in Tennessee have increased from 160 in 1992 to over 700 in 2002. Additionally, Tennessee has 826 active used oil collection centers to dispose of used oil safely. TDEC also provides grants for counties to collect waste tires for beneficial uses such as tire-derived fuel, which TVA burns at its Allen Fossil Plant in Memphis, Tennessee. As a result, over 15 million tires have been diverted from landfills. Using 1995 as the base year, per capita waste reduction and diversion rate for 2001 is 24.0 percent, compared with 22.6 percent in 2000 (TDEC, 2003).

A program for collection and safe storage and disposal of household hazardous waste has also been implemented in Tennessee. Ninety-two counties in Tennessee have

participated in the mobile collection service since it began in 1993. The program collects and properly disposes of paint, flammable liquids, corrosives, oxidizers, batteries, and pesticides. An average event yielded 23,540 pounds of household hazardous waste.

The picture for industrial solid and hazardous waste generation and handling is similar. Current legislative and regulatory programs encourage and/or mandate the reduction, recycling, and proper disposal of industrial solid and hazardous wastes. States within the TVA power service area have state-administered, RCRA-equivalent programs (programs under the Resource Conservation and Recovery Act) in the seven states of the TVA power service area, which emphasize waste reduction, recycling and proper handling and disposal of solid and hazardous wastes. Industries benefit both from a financial and a public relations standpoint by engaging in waste reduction and recycling opportunities in the same way that TVA benefits from its coal combustion byproducts (CCBs—fly ash, bottom ash, boiler slag and scrubber gypsum) marketing and utilization efforts. It is, therefore, likely that industrial solid and hazardous waste generation and disposal will continue to decline in the future.

TVA-generated Wastes - About 63 percent of TVA's total generation capacity is produced at coal-fired steam electric plants. TVA currently produces a total of about six million tons of CCBs annually at its 11 operating coal-fired steam electric plants. Over the past four-year period, production of CCBs has ranged from 5,363,207 tons in 1999 to 6,139,116 tons in 2000. This annual fluctuation in CCB production of up to plus or minus 6 percent is influenced by a variety of factors including primarily plant planned and forced maintenance outages, load swings, plant dispatch (the process by which plants are directed to increase or decrease power generation based on the cost of production at each plant—generally the larger, more efficient units run more, and the smaller, less efficient units run less), and variation in fuel supplies (British thermal unit, sulfur and ash content of the fuels burned).

TVA reduces the amount of CCBs disposed of at its plants through marketing and utilization of these byproducts in a number of commercial applications including use of fly ash in concrete products, bottom ash as aggregate in cement block manufacturing, boiler slag for roofing granules and industrial abrasives, and scrubber gypsum in gypsum wallboard and cement manufacturing. In 2002, TVA successfully marketed or utilized about 2.7 million tons of CCBs, or 47 percent of total production. Marketing and utilization of these materials avoids disposal in landfills and conserves natural resources.

TVA facilities include large, small, and conditionally exempt generators of hazardous waste. Typically, TVA facilities generate paint-related wastes (excess paints, thinners, heavy metal based paints that are removed, sandblast media from paint removal operations), heavy metal-based oils and greases, and various chemicals used in the plants and solvents. TVA reduction programs for hazardous waste, based upon source reduction, have been in place on the TVA system for some time.